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Title: COLLAPSIBLE AND INFLATABLE PISTON FOR CONTAINER. ;

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ABSTRACT:

A collapsible and inflatable piston usable for containers and other receptacles for packing requiring fluid-tight separation of the packaged product and the propellant by the piston, particularly for aerosol containers, said piston being formed from elastomeric material impermeable to gases and to liquids. This piston consists of a hollow cylindro-frustoconical vessel (1) comprising a frustoconic cap (2) closed at the top and extended by a cylindrical part (3) open at the base. This cylindrical part has externally projecting means (3a) mating a container (4) in fluid-tight manner.

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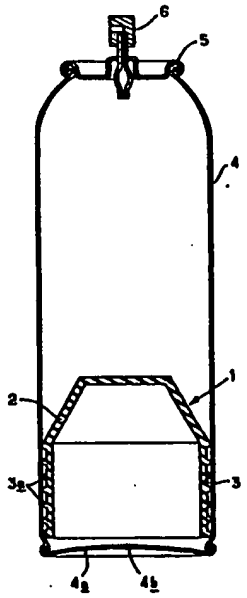
(54) Collapsible and inflatable piston for two-or multicompartmental container.

(57) A collapsible and inflatable piston usable for containers and other receptacles for packing requiring fluid-tight separation of the packaged product and the propellant by the piston, particularly for aerosol containers, said piston being formed from elastomeric material impermeable to gases and to liquids. This piston consists of a hollow cylindro-frusto-conical vessel (1) comprising a frustoconic cap (2) closed at the top and extended by a cylindrical part (3) open at the base. This cylindrical part has externally projecting means (3a) mating a container (4) in fluid-tight manner.



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The present invention is in the field of packaging fluid-tight and impermeable barriers. It is directed more precisely to an inflatable and deformable piston, particularly for producing a fluid-tight impermeable barrier for a container, for example packages of the type for aerosols.

The technique of piston type containers in which a container, for example in monocompartmental aerosol packaging is converted into a two-compartment housing, is known, but until now, no realization thereof gave satisfaction due to the fact that complete fluid-tightness between the two compartments separated by the piston was not ensured. In the same way, the constructions of the prior art did not permit the introduction of the piston through the neck of the housing, considering that pistons used until then did not have the appropriate flexibility. In the more particular field of piston-type aerosol packages, there does not exist at present on the market any container or packaging capable of ensuring perfect fluid-tightness between the two compartments, which limits the use of this technology and particularly its employment for aerosol packaging, to liquids or fluids of low viscosity or not wetting the walls of the piston and of the container . In fact, these pistons are formed of plastics material of little flexibility, the sealing between the two compartments ,namely the compartment containing the product and that containing the propellant gas, being ensured by the formation of a film of the product between the wall of the piston and that of the packaging container . Moreover, the plastics materials used are fairly

permeable to the propellants or altered by humidity . It will also be noted that this films serving for the fluid-tightness does not ensure the latter perfectly considering that it is more or less permeable to the propellant gases .

US-A-3 915352 relates to a piston-container assembly intended to be used for packaging aerosols. The piston is of the floating type which provide a poor tightness due to the physical properties of the products to be packaged. Besides GB-A-2 015 655 also relates to a piston-container assembly akin to that described in the previous US-A-3 915352, i.e. a floating piston mounted in a container.Further DE-OS-2 929 348 teaches the use of an arrangement of the floating type as described in the aforesaid documents.

It is an object of the present invention to produce a piston deformable and inflatable by the propellant gas enabling a container to be easily converted for example a single compartment aerosol container into a two-compartment container ensuring almost absolute fluid-tightness between the compartment reserved for the product and that reserved for the propellant.

Another object of the invention is to provide an inflatable and deformable piston which can be introduced through the opening or the neck of the casing or container .

A further object of the invention is to provide an inflatable and deformable pistons so designed as to insure a proper fluid tightness between the two compartments without formation of a film of product or propellant between the piston and the container wall.

Yet another object of the invention is to provide an inflatable and deformable piston comprising sealing means which can be adapted to any asperities or lack in uniformity of the inner wall of the container or casing .

Accordingly , the present invention provides a collapsible and inflatage piston,particularly useful in containers and other receptacles for packaging, for example aerosol containers, requiring fluid-tight separation between the packaged product and the propellant agent by the piston. This piston consists of a hollow body or vessel made of an elastomeric material impermeable to gazses and to liquids , said body having for example a cylindro-frustoconical shape, which is closed at one end and is extended at the other end by a cylindrical portion , forming a skirt, open at the base, said cylindrical portion having on its outer surface projecting means mating the inner wall of the container or receptacle in fluid-tight manner.

The collapsible and inflatable piston of the invention is constituted advantageously by a synthetic or natural elastomeric material, said elastomer having preferably a SHORE hardness situated within the range of 30 to 65, for example 50.

In a preferred embodiment of the invention, the projecting means, produced preferably by molding with the piston, are constituted by a plurality of outer peripheral segments, each having for example a semi-toric shape, projecting on the cylindrical portion or skirt of the piston .

The invention extends also to all containers or receptacles, particularly aerosol containers, incorporating at least one piston according to the present invention .

Other advantages and characteristics of the invention will appear on reading the following description of a non-limiting embodiment of an inflatable or deformable piston according to the present invention, with reference to the accompanying drawing in which :

Figure 1 is a perspective view of the collapsible and inflatable piston of the present invention;

Figure 2 is a sectional view on a larger scale of a flexible and inflatable piston according to the present invention mounted inside a container of the aerosol type; and

Figure 3 is a sectional view of the piston of figure 2 in inflated position during an external distribution of packaged products.

As shown in Figure 1, the collapsible and inflatable piston 1 is constituted by a dome-shaped element 2 of hollow frustoconical shape whose large base is extended by a cylindrical base or skirt 3 having a certain number of peripheral projections 3a regularly spaced and of semi-toric shape .

As shown in Figure 2, the collapsible piston 1 has been introduced through the opening of the neck of an aerosol container 4 so as to define, on the one hand, with the bottom 4a of the container 4 a first chamber containing the propellant gas and, on the other hand, with the cover 5 of the container 4, a second chamber

containing the packaged product intended to be dispensed through a distributing valve 6. On the bottom 4a of the container 4 is provided a filler hole 4b for the propellant . The skirt 3 of piston 1 comes into sealing support through the projecting segments 3a which bear against the inner wall of the container 4.

As shown in figure 3 and due to the inherent physical properties of the elastomeric material from which is made the collapsible piston,suitable deformation occur, where the packaged product must be distributed and piston 1 is moved upward swelling so that the cone 2 takes the shape of a dome whilst the projecting segments 3a become squeezed through their crest against the wall of the container 4, thus ensuring almost absolute fluid-tightness between the propellant gas and the product to be packaged.As shown in dotted lines in figure 3, the piston cone 2 is so deformed as to come in tight contact against the wall of container 4. In fact projecting segments 3a are so shaped as to enable a perfect sliding of piston 1 along the wall of container 4.

It is seen thus that, under the effect of sudden pressurization by a propellant or liquified gas, the skirt of the piston 1 inflates almost instantaneously like a balloon and is forcibly applied against the walls of the casing 4 through the projecting segments 3a. Under these conditions , sealing is ensured due to the flexibility of the constituent elastomer which, even if the inner wall of the casing or can comprises defects of uniformity or irregularities of the surface, as is the case particularly for cans of welded sheet iron, comes

into mating engagement with said defects and irregularities.

Before being inflated the piston is sufficiently rigid and adjusted to ensure a fluid-tight barrier between the compartment preserved for the product and that reserved for the propellant during filling, particularly if the product is liquid or fluid.

The introduction of the propellant gas must be effected very suddenly so as to inflate the skirt of the piston instantaneously. This introduction can be effected after an operation of heating the product for sterilization,for example, the piston ensuring suitable fluid-tightness preventing any exchange with the medium. In addition, after use, the pressure of the propellant gas must remain sufficient to keep the skirt applied against the wall of the container with sufficient force in order to maintain fluid-tightness . This final pressure must be of the order of 2.5 to 3x 10^5 Pa and it is a function of the flexibility of said skirt.

On the other hand,the flexibility and thickness of the barrier elastomer used as well as the geometry of the piston enable its introduction, either into swaged cans before crimping of the dome or of the bottom, or through the neck of one-piece cans. The ratio of the diameters aperture/body of the piston must be comprised within the range of 0.7 to 1 (case of introduction by aspirating deformation).

In the general case, it is understood that the piston for ratios of diameters aperture/body less than 0.7, must be introduced during the manufacture of the two or multicompartmental can.

The advantage of the piston according to the present invention is that, for suitably selected ratios, it enables the manufacturer and aerosol packager to convert his monocompartmental containers or cans into two or multicompartmental packaging devices by introducing the one or more pistons through the aperture after having formed an orifice at the bottom of the can for the introduction of the propellant or for the production of vaccuum. Suitable tooling facilitates this insertion by forming a reduced pressure in the can and beneath the piston, which facilitates by aspiration its positioning in the body of the can.

Thus by the present invention the problem of fluid-tightness between the chambers of two- or multicompartmental containers becomes solved, due to the incorporation inside the cans or containers of at least one flexible and inflatable piston according to the invention

It is clear that the invention is in no way limited to the embodiment described above with reference to the accompanying drawings, but it encompasses all modifications and variations derived from the same principle of construction . Thus if in the drawings the number of projecting segments 3a has been limited to seven, a value for which almost perfect fluid-tightness is ensured, this number of projecting segments is in no way limited,said projecting segments being also intended to guide the piston within the container and avoiding said piston to be tilted within said container.

WHAT WE CLAIM IS:

1. A collapsible and inflatable piston, particularly useful in containers and receptacles for packaging requiring a perfect fluid-tight separation between the packaged product and the propellant agent for said piston and to liquids, characterized in that said piston consists of, a hollow body or vessel (1) made of an elastomeric material impermeable to gases, said body comprising a cap (2) closed at the top and extended by a cylindrical portion (3) open at the base, forming a skirt, said cylindrical portion having externally projecting means (3a) mating in fluid-tight manner the inner wall of the container or receptacle (4).

2.The collapsible and inflatable piston as set forth in claim 1,comprising a hollow cylindro-frustoconical body or vessel (1) having a frustoconical portion (2)closed at the top and extended by a cylindrical portion (3) open at the base, forming a skirt, said cylindrical portion having externally projecting means mating the inner wall of the container or receptacle (4) in fluid-tight manner.

3. The collapsible and inflatable piston as set forth in claim 1 wherein the projecting means comprise a plurality of outer peripherical segments (3a) projecting on the cylindrical portion (3).

4.The collapsible and inflatable piston as set forth in claim 3,wherein the outer peripheral segments have each a semi-toric shape.

5.The collapsible and inflatable piston as set forth in claim 1, wherein the sealing means are produced by molding with the piston.

6.The collapsible and inflatable piston as set forth in claim 1 wherein the constitutive elastomeric material of said piston is selected among the synthetic elastomeric materials and the natural elastomeric materials.

7.The collapsible and inflatable piston according to claim 6,wherein the elastomeric material has a Shore hardness situated in the range of 30 to 65.

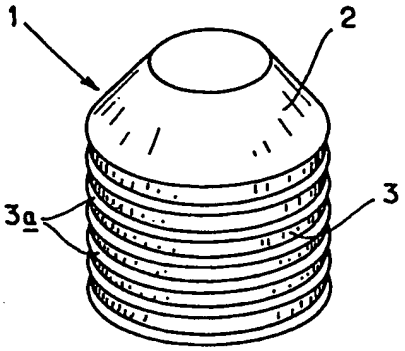

FIG. 1

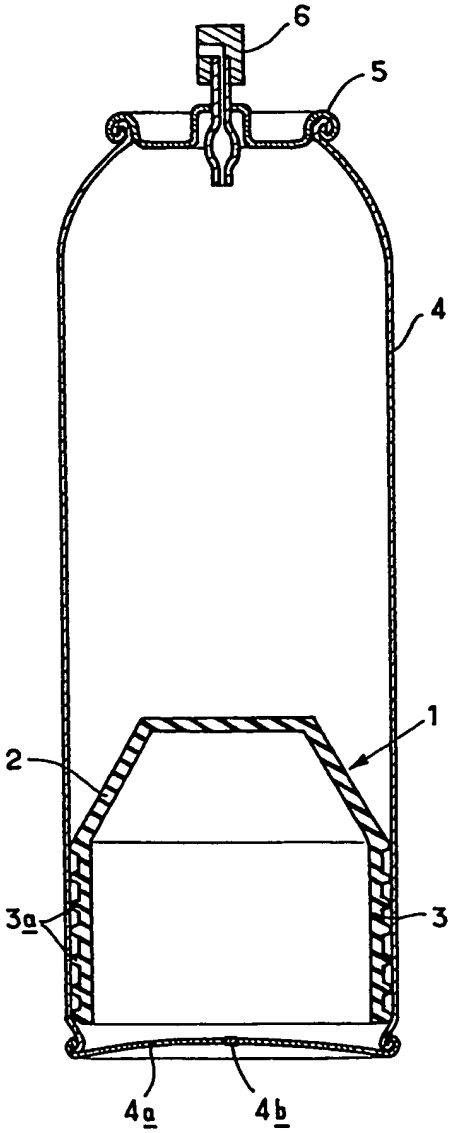

FIG. 2

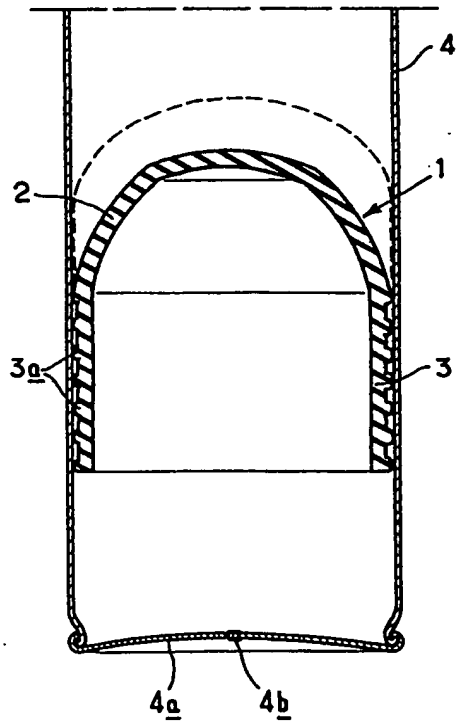

FIG. 3

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EUR PEAN SEARCH REPORT

Application number

EP 87 40 0659

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,X	US-A-3 915 352 (SCHEINDEL) * Column 2, lines 24-51; column 3, lines 43-54; figures 1,5,6 *	1-6	B 65 D 83/14
D,X	GB-A-2 015 655 (SCHUMACKER) * Page 2, lines 54-84; page 2, line 120 - page 3, line 24; figures 1-6 *	1-3,5, 6	
D,X	DE-A-2 929 348 (THE CONTINENTAL GROUP) * Page 9, line 8 - page 10, line 1; page 10, line 16 - page 11, line 8; figures 1-3 *	1-3,5, 6	
A	FR-A-1 360 188 (THE PROCTER & GAMBLE CO.) * Abstract; figures 1-6 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4) B 65 D B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19-06-1987	VANTOMME M.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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